and is about 60 mm. in length and 75 mm. in breadth. It includes that part of the large intestine which lies below the entrance of the small intestine, and also its prolongation, the appendix.

The cæcum lies in front of the ilio-psoas muscle, and its relations to the walls of the abdomen and the other divisions of the alimentary tract vary, according as they are distended or collapsed. When the cæcum is somewhat distended and the small intestine nearly empty, it comes into direct contact with the anterior abdominal wall and comes at once into view, together with a portion of the ascending colon, when the abdomen is opened by means of a crucial incision and the flaps drawn back. In this

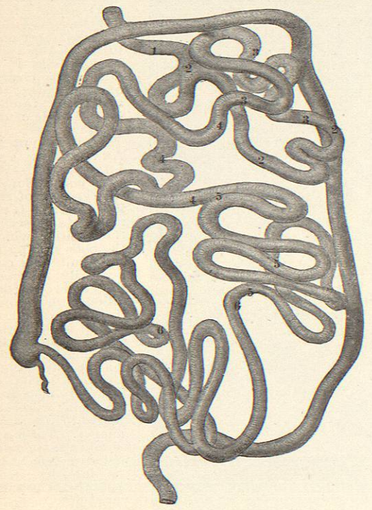

FIG. 80.—The Relation of the Coils of the Small Intestine to One Another and to the Large Intestine. The figures designate, as in the preceding figure, homologous portions of the intestine. The course which this intestine takes is that of the normal type. (After Mall.)

case it lies above the outer half of Poupart's ligament. On the other hand, when the small intestines are distended or when they have been pushed to the right by a distended sigmoid colon, the cæcum is covered by the coils of the small intestine, which are interposed between it and the abdominal wall in front.

Appendix Vermiformis.—The appendix arises from the inner and back part of the cæcum. It varies in size, the extremes being 1 or 2 mm. as the shortest and 23 mm. as the longest. Its average length is 9.2 mm. and its diameter 6 mm. The place where the appendix unites with the cæcum can be found by following any two of the three longitudinal bands of muscle which characterize the large intestine, into the right iliac fossa.

The course which the appendix takes varies greatly. It may be drawn out straight. It may be wound into a spiral. Its position also varies, but it will generally be found passing from behind the cæcum, either upward and to the left behind the ileum and mesentery, in the direction of the spleen, or downward and to the left so as to lie on the brim of the pelvis, or even project into that cavity. Sometimes it is situated entirely behind the cæcum. The appendix is usually hollow throughout its entire extent. The opening into the cæcum is often described as being guarded by a valve. Berry has, however, shown that this valve is inconstant and without any importance.

Ascending Colon.—The ascending colon extends from the cæcum below to the *flexura coli dextra* above. It passes at first obliquely backward to the dorsal wall of the abdomen. It then takes nearly a vertical direction, and in its upper portion bends forward toward the abdominal wall. Its posterior circumference borders, on this median side, upon the psoas muscle. After it has left the right iliac fossa, it lies first upon the quadratus lumborum and then on the lower portion of the right kidney. Laterally, it touches the abdominal wall; above, it is completely covered by the coils of the small intestine. When it is highly distended, it may push the small intestine so far to the left that a small portion is visible on opening the abdomen.

The angle which the ascending colon makes with the transverse colon is quite distinct. In the flexure the large intestine does not pass directly across the abdomen, but bends somewhat toward the anterior wall of the abdomen, on account of the adjoining organs. From the kidney the large intestine must pass toward the ventral side of the abdomen, in order that it may get in front of the duodenum and pancreas.

The Transverse Colon.—In front the flexure is covered by the liver, and below it rests upon the coils of the intestine. In the normal condition, when the abdomen is opened, the transverse colon cannot be seen, being covered by the great omentum (Fig. 79). If one cuts off the omentum or turns it up, the transverse colon is brought into view. In the latter case it appears to run directly from the right to the left. This is, however, a false appearance, due to the fact that the colon is drawn upward out of its normal position. In its normal condition the transverse colon runs in a slight bend, with its convexity below and in front.

The left end of this convexity lies on a higher plane than its right, because the right flexure of the colon is prevented by the liver from rising as high as the left flexure. In front of the transverse colon lies the great omentum, and, since this is a thin membrane, we can say that the transverse colon is in contact with the ventral wall of the abdomen. The left portion of the transverse colon borders upon the great curvature of the stomach in such a manner that the lower convex bend of the intestine nearly corresponds to the line of curvature of the stomach. This close relation between the stomach and the transverse colon makes it often difficult to determine their respective boundaries by percussion.

The left flexure of the colon forms a continuation of the transverse colon. It lies behind the fundus of the stomach, in front of the left kidney, and extends as far as the basal surface of the spleen. The angle which thetransverse colon and the descending colon form with each other in this flexure is much more acute than that which is present in the right flexure. Not infrequently the adjoining portions of the two arms of the flexure lie close beside each other. The relation of the transverse colon to the adjoining viscera, and of the arms of the flexure to each other, may be considerably changed by a distended or collapsed condition of the intestines.

Descending Colon.—The descending colon bears much the same relation to the body wall as does the ascending colon. Above, it rests upon the convex border of the left kidney, and then passes slightly toward the median line. It extends below to the left iliac fossa, where it joins the sigmoid colon. It is overlaid by the small intestine, and in its normal condition is not exposed to view when the abdomen is opened.

Sigmoid Colon.—The sigmoid colon occupies a very considerable portion of the iliac fossa. It is connected above with the descending colon, and below it passes over a brim of the pelvis and joins the rectum. The upper portion of the sigmoid colon is usually firmly fixed in the

fossa; but the lower part is quite movable, in consequence of which it may at times form a loop, which hangs down into the true pelvis.

Rectum.—The rectum is the last division of the large intestine, and is situated entirely within the true pelvis. It extends from the sigmoid colon to about the anus. From the brim of the pelvis, where it joins the sigmoid colon, it passes downward, backward, and to the right in order that it may reach the median line. In general it follows from this point the curve of the sacrum and coccyx, and ends in the anal canal. The anterior wall of the rectum is longer and more curved than the posterior. In children the rectum has a straighter course than in adults, and is of a relatively larger size.

Variations.—The remaining twenty cases examined can be divided into five groups. The first group consists of six cases in which loop 4 (Fig. 80) extended to the left side of the body. The remainder of the small intestine occupied the position given above.

The second group also consisted of six cases. In these cases the loop 4 was also on the left side, and in addition the loops 1 and 2 were pushed to the right side of the abdomen; that is, all the upper portion of the jejunum formed coils which were situated on the right side of the abdomen.

In the third group there were five cases. The variation here was occasioned by a supernumerary coil from that portion of the small intestine which is situated in the hypogastric region, extending up into the umbilical and right lumbar regions. Sernoff has also described similar cases.

The fourth group consisted of two cases in which coil 4 was again carried to the left side, and the space which it should occupy was filled by two coils, one of which came from the upper part of the jejunum, while the other came from the lower portion of the ileum.

The fifth and last variation was found but once. Loop 4 was elongated, and its place was occupied by a large loop which came up from that part of the ileum which is situated in the hypogastric region. A similar case has been described by Henke.

It is interesting to note that in four of these five groups, loop 4 takes some part in the variation.

William S. Miller.

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ALIMENTATION, RECTAL.—Rectal alimentation is employed whenever nutrition in the ordinary way (by the mouth) is either impossible or not desirable. This method of alimentation was already used in the Middle Ages and in ancient times. Aetius[1] occasionally mentions such method of feeding. The value of this way of nourishing a patient, however, was believed to be very slight, until extensive experimental researches with reference to absorption of food from the large bowel had been made. These definitely showed that digestion to a great extent can proceed in the colon if the ingested food is suitably prepared. Among the earliest investigators in this direction were Hood[2] and Steinhäuser.[3] Hood observed that a piece of mutton introduced into the rectum and retained, after some time showed evident signs of digestion. Steinhäuser experimented on a patient with a fistula of the ascending colon, and found that pieces of albumen introduced into the fistula could not be discovered in the fæces. Pieces of smoked beef and apples, on the other hand, were found either slightly altered or entirely unchanged in the stool.

Eichhorst[4] stated in 1871 that absorption of albuminates from the bowel is facilitated, if not made possible, by the addition of common table salt. He experimented principally with egg albumen mixed with the yolk and with milk. Some years later, Ewald[5] observed the very interesting fact that raw eggs were much better absorbed from the large intestine than artificially peptonized foods (Kemmerich's peptone).

Filippi[6] experimented on animals by resecting portions of the intestinal canal. He found that after extirpation of seven-eighths of the small intestine in a dog, there was no appreciable decrease in the absorption of foods consisting of albuminates and carbohydrates, while nineteen per cent. of the ingested fat returned with the fæces. This clearly shows that the colon can vicariously do the work of the small intestine. It further demonstrates that albuminates can be absorbed from the large intestine and enter the lacteals without previous peptonization. These remarkable statements have been confirmed by Aldor.[7] This writer experimented principally with milk, and ascribed the coagulation of the milk in the large bowel to the action of bacteria, not to enzymes. He found that after the injection of from ten to fifteen ounces of milk into the bowel, intestinal lavage, performed one to one and a half hours later, showed only minute particles of milk. The spontaneous evacuation resulting thereafter likewise contained but very small portions of coagulated milk.

Aldor, in his paper, arrived at the following conclusions:

1. A quart of milk, injected by means of a fountain syringe into the bowel, produces no pains either during the injection or afterward. No irritation of the intestine follows, and milk is most suitable for a nutritive enema.

2. The coagulation of the milk, which is due to the action of the bacterium coli commune, is rather detrimental to absorption. This coagulation can be prevented, (*a*) by thorough lavage of the bowel before giving the nutritive enema, (*b*) by adding 1 to 1.5 gm. (gr. xvi–xxiv.) of sodium carbonate to one quart of milk.

3. No digestion takes place in the large bowel.

4. Carbohydrates are absorbed in an excellent manner, albuminates in a great measure, and fats but poorly.

5. After an injection of a quart of milk into the bowel, there was never found either albumin or sugar in the urine.

In America the attention of the medical profession was first directed to rectal alimentation by Austin Flint,[8] who read an extensive and important paper on this subject before the New York Academy of Medicine in December, 1877. Flint mentioned a case in which a woman was almost wholly nourished per rectum for five years. After emphasizing the importance of rectal alimentation in instances in which the usual mode of nutrition fails or is impossible, he gives directions as to the mode of employment of the nutritive enemata. From three to six ounces of fluid or semi-fluid foods may be injected at intervals of from three to six hours. He did not deem it necessary to wash out the rectum prior to each administration of the nutritive enema. Flint, as well as Peasley, Fordyce Barker, A. H. Smith,[10] and G. M. Smith,[9] who took part in the discussion of the above paper, had all practised this method of feeding with best results. A. H. Smith mentioned several instances of gastric ulcer in which nutrition had been successfully maintained by

rectal alimentation for from eleven to sixteen and twenty-one days. He was the first who suggested the use of defibrinated blood for this purpose.

Very shortly afterward W. Bodenhamer[11] published an instructive monograph on rectal medication, in which he also laid stress upon the practical value of rectal alimentation as deserving much more frequent application than heretofore.

Stillman,[12] in his paper on rectal alimentation, says: "The clinical fact remains that certain foods, digested or undigested, are taken into the system when thrown into the rectum; that the power of absorption there may be good when the stomach is weak and rebellious; that it is assimilated, for the body gains in flesh and power, and that there may be merely the customary evacuation as an excretory resultant. As far as I am aware, no danger attends feeding by the rectum, when conducted with ordinary care and intelligence on the part of nurses or attendants." In this paper Stillman calls attention to the use of supplementary rectal feeding, *i.e.*, to the use of nutrient enemata while the stomach is yet performing its functions to quite a considerable extent, as, for instance, in chronic gastritis, gastralgia, nausea, etc. He used principally enemata of milk according to the following formula: 5 grains of Fairchild's pancreatic extract and 15 grains of bicarbonate of soda to a pint of milk.

The writer has had extensive experience with rectal alimentation and is fully convinced of its great practical value. The indications for this mode of alimentation may be summarized as follows:

1. In conditions in which the passage of food from the mouth to the stomach or to the small intestine is impeded or made impossible (strictures, benign or malignant, of a high degree of the œsophagus or cardia, spasmodic or paralytic conditions of the œsophagus, pyloric or duodenal stenosis).

2. In ulcer of the stomach accompanied by considerable hemorrhage, or when the usual methods of treatment have failed.

3. Incessant vomiting, no matter to what cause it be due.

4. In all conditions in which absolute rest for the stomach seems to be imperative (intense pains soon after ingestion of food; persistent hyperchlorhydria of a high degree; intense chronic continuous gastro-succorrhœa; pronounced ischochymia).

5. In typhoid fever and other severe lesions of the small intestine necessitating a complete rest of this portion of the bowel.

For how long a period rectal alimentation should be administered depends upon the condition necessitating it. In ulcers and irritating affections of the stomach, rectal alimentation should be administered alone, without any additional nourishment through the mouth, for a period varying from one to two weeks, when the natural mode of nutrition may be cautiously resumed. In cases in which there is an organic obstacle within the œsophagus or at the pylorus preventing the passage of food into the intestine, rectal feeding must be carried on as long as the impediment exists (in operative cases until a few days after the operation has been performed; in inoperable cases, indefinitely). Here, whenever possible, besides the enemata, small quantities of liquid foods may also be given by way of the mouth.

Shortly after operations on the œsophagus, stomach, and small intestine, rectal alimentation must be administered for a period varying from four days to a week or ten days.

Mode of Administration.—Before administering the feeding enema, a cleansing injection (consisting of a quart of water and a teaspoonful of salt) should be given early in the morning, in order thoroughly to evacuate the bowel. One hour later the first rectal alimentation may be administered. The feeding enema is best injected by means of a fountain or Davidson syringe, or a plain hard-rubber piston syringe, and a soft-rubber rectal tube, which is introduced into the anus for a distance of about five to seven inches. The injection should be administered slowly and without much force. After the withdrawal of the tube from the rectum, the patient is told to lie quietly and to endeavor to retain the enema. The quantity of the feeding enema may be from five to ten ounces. From three to five such enemata may be given daily.

The following substances may be used as feeding enemata:

(*a*) The different kinds of peptones and propeptones in the market (Rudisch's or Kemmerich's peptone, somatose, sanose), of which about two to three ounces dissolved in from six to eight ounces of water are to be injected. The different beef juices (Valentine's beef juice, bovinine, Mosquera's beef jelly, etc.) may also be dissolved in water and injected in corresponding quantities.

(*b*) The milk and egg enemata; these are the most commonly used. Their composition is as follows: six to seven ounces of milk, one or two raw eggs well beaten up in it, one teaspoonful of powdered sugar, and one third of a teaspoonful of common table salt.

Pancreatin (one tube of Fairchild's pancreatin) may be added to such an enema, to facilitate its assimilation.

(*c*) Meat pancreas enema. Leube[13] employs enemata consisting of well-chopped meat (five ounces), fresh pancreas (two ounces,) one ounce of fat (butter)—all these ingredients being thoroughly mixed with about six ounces of water.

Instead of always using one and the same nourishing enema, the above combinations may be alternately administered.

In conjunction with these food enemata, injections of water into the bowel are made in order to increase the amount of fluid in the system. These injections of water for absorption are of great importance. Usually saline solutions are employed, in quantities varying from a pint to a quart, which may be given twice a day.

Max Einhorn.

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ALKAKENGI. See *Solanaceæ*.

ALKALIES, ANTACIDS.—These are medicines which are administered for the purpose of correcting acidity. The terms are almost synonymous, but it will be found that the drugs arrrange themselves into two groups, according to their solubility, which in a great measure determines their therapeutic uses. In one we have potash, soda, and lithia; in the other lime, magnesia, cerium. The former are generally employed as alkalies, the latter as antacids. Ammonia is intermediate; its character would place it in the first group, but its therapeutic use makes it belong rather to the second.

Potash, soda, and lithia salts are very soluble, and are readily absorbed and as readily excreted; they pass from the system in a very short time. They are normal constituents of the blood, and their presence in increased amount tends to render the plasma more alkaline.

The second group, comprising lime, magnesia, and cerium, are much less soluble, and even their more soluble salts (as the sulphates of magnesia, etc.) are but slowly

absorbed. In consequence their action is almost entirely limited to the digestive tract. Such portions as do enter the circulation act upon the blood in the same manner as do the more soluble alkalies, and are excreted by the same channels. Their power of rendering the blood alkaline is so inferior to that of the more soluble alkalies that they are never selected for this purpose. Many of their soluble salts, as the chlorides, phosphates, and hypophosphites, are only mildly alkaline, and are of value more for the acids in combination than for the alkaline base.

The action of alkalies upon the secretions of the stomach, as formulated by Ringer, has been confirmed by subsequent experience. His view is that the contact of weak alkaline solutions with glands secreting an alkaline fluid causes a lessening of the secretion, while on acid-secreting glands the effect is to cause an increase of the acid secretion. Advantage has been taken of this in gastric disturbances, when there is a deficiency of acid during digestion. The administration of alkalies just before meals has proved most serviceable in relieving this defect. They must be given well diluted and in moderate doses. The bicarbonate of soda or the bicarbonate of potash is generally selected; it is to be given in five-grain doses. Ammonia, in the form of the aromatic spirits, is often combined with some stomachic, as tincture of rhubarb, tincture of cardamons, capsicum, ginger, or peppermint, and in addition a vegetable bitter. This combination has been found to be valuable. In addition to the local effect thus produced upon gastric digestion, a further benefit is derived by the action of alkalies after absorption. They rapidly pass into and improve the blood, and during excretion they cause a general stimulation of all secreting organs. As alkalizers of the blood, they are used in gouty and rheumatic conditions, in lithiasis, and in many disorders of the skin in which there is supposed to be an excess of uric acid or allied acids in the blood. Their purpose is to keep these morbid products in solution until they are carried out of the system. The potassium salts are preferred, as their rapid absorption renders the blood more quickly alkaline, while their equally rapid excretion prevents any accumulation. For immediate action the solution of potash or the bicarbonate salt is selected; but when a prolonged use is required, the citrate, acetate, or tartrate is preferred, as these salts produce less irritating effects upon the stomach. Sodium salts are more slowly absorbed and are less powerful alkalies. The normal alkaline state of the blood is due chiefly to sodium salts, and as they are less depressing than potassium salts, they offer many advantages when a prolonged course of treatment is necessary. In treating rheumatism with the alkalies, they require to be given freely until the urine becomes alkaline, and then they should be reduced, enough being given simply to maintain this reaction. There may be given a drachm and a half of bicarbonate of soda and half a drachm of the acetate of potash every three or four hours, well diluted, for four or five doses; following this, fifteen or twenty grains will usually be sufficient. Lithia is very similar to potash in the rapidity of its absorption and excretion. It has been extolled as superior to the other alkalies, and is now very generally used. Later observations, however, tend to lessen this estimate. It has been shown that its solvent action is not remarkable, and it is probable that its value lies in its diuretic properties. The action of ammonia is very evanescent; it is never employed to replace the other alkalies, as its effect is to increase the acidity of the urine.

The alkalies are excreted rapidly by all the secreting organs. Their effect is most evident on the kidneys, and during excretion they render the urine alkaline. At the same time they augment the watery flow through an increased activity of the renal cells. The secretion of all organs is increased, as is also the secretion of the mucous surfaces.

The action of alkalies upon the blood and tissues is as yet imperfectly understood. We know that they promote tissue change and favor elimination. We also know that they prevent the deposition of uric acid in the tissues. How this is effected is uncertain, but their action depends upon something more than simply rendering the blood alkaline. Until the true cause of gouty and rheumatic affections is discovered, an explanation will be difficult. We seem further from a solution than ever, now that the existence of any excess of uric acid in these attacks is being called in question.

Alkalies are all powerful depressors. Potash and lithia are the most injurious, and soda is the least. They reduce the blood corpuscles and the protoplasmic tissue. In large doses they are cardiac poisons, and their prolonged use in moderate doses causes anæmia, loss of body weight, and loss of muscular power.

The alkalies are also of benefit when applied to the surface of the body. In rheumatism a hot lotion of carbonate of soda with opium often affords relief to the painful joint. In all forms of cutaneous disease accompanied by a troublesome itching, an alkaline wash of carbonate of soda or potash, half a drachm to the pint, is of service, and in eczema during the early stage, with an alkaline watery discharge, the same solution is curative. Burns and scalds may be treated in the same way, the solution being constantly applied. The alkali removes the heat and pain and allays inflammatory action. The bites and stings of insects and the urticaria produced by poisonous plants are also benefited.

The oxides and carbonates of lime and magnesia are the most serviceable salts as antacids, on account of their insolubility. If these drugs are given in small quantities their action may be limited to the stomach; when they are freely administered, their action is continued into the intestines. They neutralize all acids with which they come in contact, and by contact with the mucous surface they exercise a soothing and sedative effect. In addition to neutralizing the local acids, they are of value as antidotes in poisoning by acids, and also in poisoning by vegetable poisons, the alkali precipitating the poisonous alkaloids and retarding their absorption. In the intestine the antacid action is continued, but the ultimate effects of lime and magnesia differ; the former acts as a mild astringent, while the latter becomes converted into the bicarbonate and acts as a laxative.

The soluble alkalies are not so useful as antacids, and are of little service when an effect in the intestines is required. Sodium bicarbonate, however, is a well-known antacid. Its disadvantages are that it tends to generate a large amount of carbonic acid gas, and is stimulating instead of soothing to the mucous surface. The aromatic spirits of ammonia is similar in its action and more rapid. Cerium oxalate and bismuth are both useful antacids, their chief value being due to the local soothing action which they exert upon the mucous membrane. The cerium salt has probably a sedative action on the terminals of the nerves.

Beaumont Small.

ALKANET.—(*Orcanette.*) The fleshy root of *Alkanna tinctoria* (L.) Tausch. (fam. *Boraginaceæ*), a small perennial herb of Europe and Asia Minor, largely cultivated for its coloring matter. The dried root, a foot or more in length and about a half-inch in thickness, its bark purple red without, deep red within, its wood pinkish white, is sometimes marketed entire, but more frequently as a stringy, shredded, tough mass. Its only value is for coloring purposes, the coloring matter being *alkannin* or *alkanna* red.

Alkannin is a dark, brownish-red, resinous mass, insoluble in water, but soluble in alcohol and ether. Acids intensify the red color, alkalies convert it to a bluish green, in which respect it acts like *hæmatoxylin*.

H. H. Rusby.

ALLANTOIS.—(From N. L., *allantoides*; Greek, ἀλλᾶς (ἀλλάντ), a sausage, and εἶδος, form: sausage-shaped.) The allantois is one of the fœtal membranes peculiar to the group of higher vertebrates in which the embryo is enveloped in an amnion, the Amniota.